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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/694,986

10/29/2003

Masaharu Nagai

12732-171001

5334

26171 7590 10/08/2009
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EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT

PAPER NUMBER

1795

NOTIFICATION DATE

DELIVERY MODE

10/08/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

Office Action Summary	Application No. 10/694,986	Applicant(s) NAGAI ET AL.	
	Examiner DABORAH CHACKO DAVIS	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5,6,9,10,20,21,24,25,28,29,32,33 and 36-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 2,6,10,21,25,29,33 and 37 is/are allowed.
- 6) ☒ Claim(s) 1,5,9,20,24,28,32,36,38,40,42,44,46,48,50 and 52 is/are rejected.
- 7) ☒ Claim(s) 39,41,43,45,47,49,51 and 53 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>06/09</u> . | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

1. Applicant is advised that should claims 1, 5, 9, 20, 24, 28, 32, and 36, be found allowable, claims 38, 40, 42, 44, 46, 48, 50, and 52, will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Objections

2. Claims 39, 41, 43, 45, 47, 49, 51, and 53, are objected to under 37 CFR 1.75 as being a substantial duplicate of claims 2, 6, 10, 21, 25, 29, 33, and 37. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 9, 20, 24, 32, 36, 38, 42, 44, 46, 50, and 52, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 4,646,424 (Parks et al.,

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hereinafter referred to as Parks) in view of U. S. Patent Application Publication No. 2002/0151156 (Hallock et al., hereinafter referred to as Hallock).

Parks, in col 2, lines 59-68, in col 3, lines 1-10, in col 6, lines 3-59, discloses a method of forming a semiconductor device by forming a gate electrode on a substrate, forming a positive resist pattern (the resist is photosensitive, contains a photosensitizer) on the gate material film (metal layer), plasma etching (dry etching) the gate material film exposed using the resist pattern as the mask, removing the remaining resist material (after etching the metal i.e., titanium) by using a stripper (stripping the remaining resist, resist removing process, a resist stripper dissolves and removes the remaining resist). The resist pattern is formed by forming a resist layer on a metal layer (such as titanium), exposing the resist, and developing the resist to form a resist pattern (claim 1). Parks, in col 1, lines 8-11, and in col 2, lines 59-65, discloses that the metal film is a titanium film and the titanium forms a gate electrode material in a thin film transistor (claims 9, and 24). Parks, in col 6, lines 5-7, discloses that the substrate material is glass (claim 20).

The difference between the claims and Parks is that Parks does not disclose that after the dry etch process (etching the metal film using the resist pattern) the resist pattern is irradiated with light. Parks does not disclose that that light irradiated on the resist pattern has multiple wavelengths and/or having wavelength of the photosensitizer in the resist, as recited in claims 32, and 36.

Hallock, in [0015], [0017], [0019], [0020], [0021], and [0025], discloses that the resist pattern is subjected to a UV radiation exposure such that the entire resist pattern

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is exposed to UV, including the underlying bulk photoresist (i.e., under the crust), and then stripping the irradiated resist pattern via a wet stripping process to remove the resist pattern, wherein the exposure uses UV radiation of multiple wavelengths (wavelengths between 150nm to 450nm) or a wavelength region applicable to the photoresist i.e., causing a reaction in the photosensitizer presenting the resist pattern (UV exposure causing a photochemical rearrangement in the resist pattern).

Therefore, it would be obvious to a skilled artisan to modify Parks by employing the method of irradiating the resist pattern after a dry etch process using wavelengths in the claimed range, and stripping as suggested by Hallock, because Hallock, in [0014], discloses that performing the UV exposure prior to the stripping process enables removal efficiency for the subsequent stripping process, and results in a faster throughput with minimal or no blistering.

5. Claims 5, and 40, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 4,646,424 (Parks et al., hereinafter referred to as Parks) in view of U. S. Patent Application Publication No. 2002/0151156 (Hallock et al., hereinafter referred to as Hallock) as applied to claims 1, 9, 20, 24, 32, 36 above, and further in view of U. S. Patent No. 6,645,851 (Ho et al., hereinafter referred to as Ho).

Parks in view of Hallock is discussed in paragraph no. 4.

The difference between the claims and Parks in view of Hallock is that Parks in view Hallock does not disclose the photosensitizer recited in claims 5-6.

Ho, in the abstract, and in col 4, lines 1-19, discloses that the photoresist

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composition used for forming the photoresist pattern mask is a novolac type resin that includes a photosensitizer such as diazonaphthoquinone compound.

Therefore, it would be obvious to a skilled artisan to modify Parks in view of Hallock by employing the photoactive compound (photosensitizer) suggested by Ho in the photoresist composition because Ho, in col 9, lines 43-54, discloses that adding the claimed photosensitizer (DNQ) in the photoresist composition enables the use of the formed photoresist composition (novolac resin + DNQ) in wavelengths such as 300nm to about 500nm, and also aids in the lowering of the melt temperature of the formed photoresist layer below the glass transition temperature of the novolac resin.

6. Claims 28, and 48, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 4,646,424 (Parks et al., hereinafter referred to as Parks) in view of U. S. Patent Application Publication No. 2002/0151156 (Hallock et al., hereinafter referred to as Hallock) as applied to claims 1, 9, 20, 24, 32, 36, above, and further in view of U. S. Patent No. 4,673,808 (Katohno et al., hereinafter referred to as Katohno).

Parks in view of Hallock is discussed in paragraph no. 4.

The difference between the claims and Parks in view of Hallock is that Parks in view of Hallock does not disclose that the resist stripper has a mixture of 2-aminoethanol and a glycol ether (claim 28).

Katohno, in col 5, lines 20-28, and lines 65-67, discloses the use of a Nagase stripper solution (Nagase N-series stripper solution is blend of aminoethanol and glycol ether) to remove the remaining resist pattern (after etch processes).

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Therefore, it would be obvious to a skilled artisan to modify Parks in view of Hallock by employing the stripper solution suggested by Katohno because Parks in col 6, lines 55-59, teaches using a resist stripper to remove the remaining resist material and Katohno, in col 5, lines 1-30, discloses that using the claimed resist stripper (Nagase stripper solution) enables the removal of the resist by releasing thus avoiding the presence of the residual portions of the resist pattern on the metal plate to be patterned.

Allowable Subject Matter

7. Claims 2, 6, 10, 21, 25, 29, 33, and 37, are allowed. See Remarks, filed December 18, 2008, on page 7, paragraph nos. 2-3, and page 8, paragraph nos. 1-2.

Response to Arguments

8. Applicant's arguments, see Remarks, filed June 9, 2009, with respect to claims 1, 5, 9, 20, 24, 28, 32, and 36, have been fully considered but they are not persuasive.

The 103 rejections made in the previous office action are maintained.

A) Applicants argue that neither Parks, nor Hallock, nor Ho, nor Katohno teaches that the resist pattern is irradiated with a light have a photosensitive wavelength region of the photosensitizer to expose the resist pattern entirely to the light after etching the metal film.

Neither Parks nor Ho, nor Katohno is relied upon to disclose the irradiation of the resist pattern in the claimed manner. Hallock, as discussed above, in paragraph no. 4, discloses the use of a UV irradiation that uses a wavelength that will cause the photosensitizer in the resist pattern to react i.e., cause a photochemical reaction or

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rearrangement in the resist pattern, and then perform a wet stripping process on the UV irradiated resist pattern to dissolve and remove the resist pattern. Hallock does not teach that the sidewalls are masked or that the resist pattern (photoresist mask) is masked partially to prevent UV exposure. Hallock, in paragraph no. [0019], discloses that the photoresist mask, including its ion-implanted surface, and the substrate upon which the photoresist mask resides is entirely exposed to the UV radiation exposure.

B) Applicants argue that Hallock's resist pattern mask has a crust surface, and that Hallock only teaches irradiating the surface of the resist pattern and does not teach exposing the resist pattern entirely.

Hallock, in paragraph nos. [0018] through [0020], discloses that the ion implantation process performed, earlier, on the substrate with the photoresist mask (resist pattern), causes the formation of the crust on its surface, and therefore, the resist pattern mask that has the ion-implanted surface is subjected to UV exposure; Hallock teaches that the entire substrate is subjected to the UV exposure, and that the UV radiation causes photochemical reaction in the underlying bulk of the photoresist i.e., not the crust surface of the photoresist pattern. Therefore, Hallock teaches exposing the resist pattern entirely to UV radiation.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Daborah Chacko-Davis/
Examiner, Art Unit 1795

October 1, 2009.